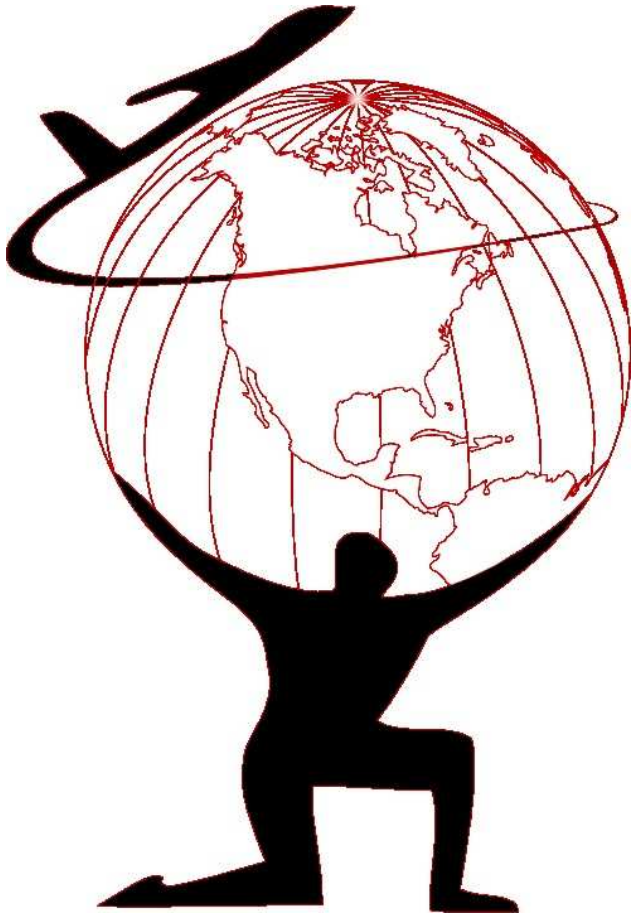
gFEX Status For Link Speed Test



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G. Stark, S. Tang, W. Wu

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gFEX Integration

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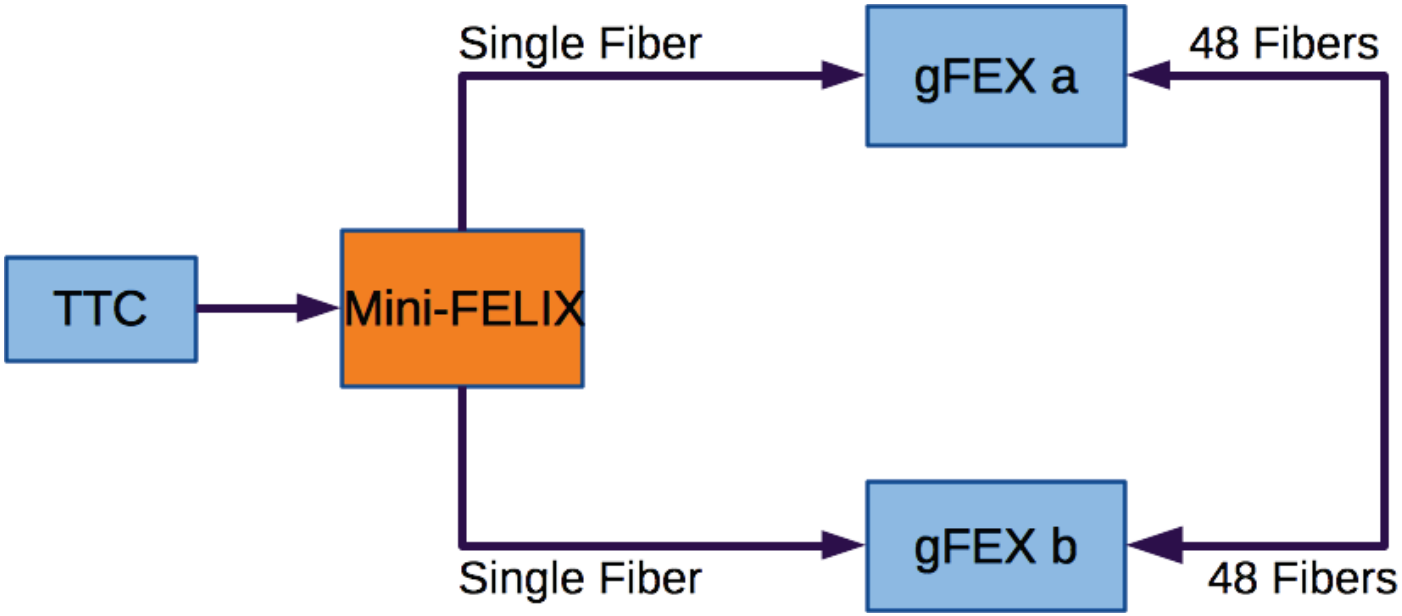
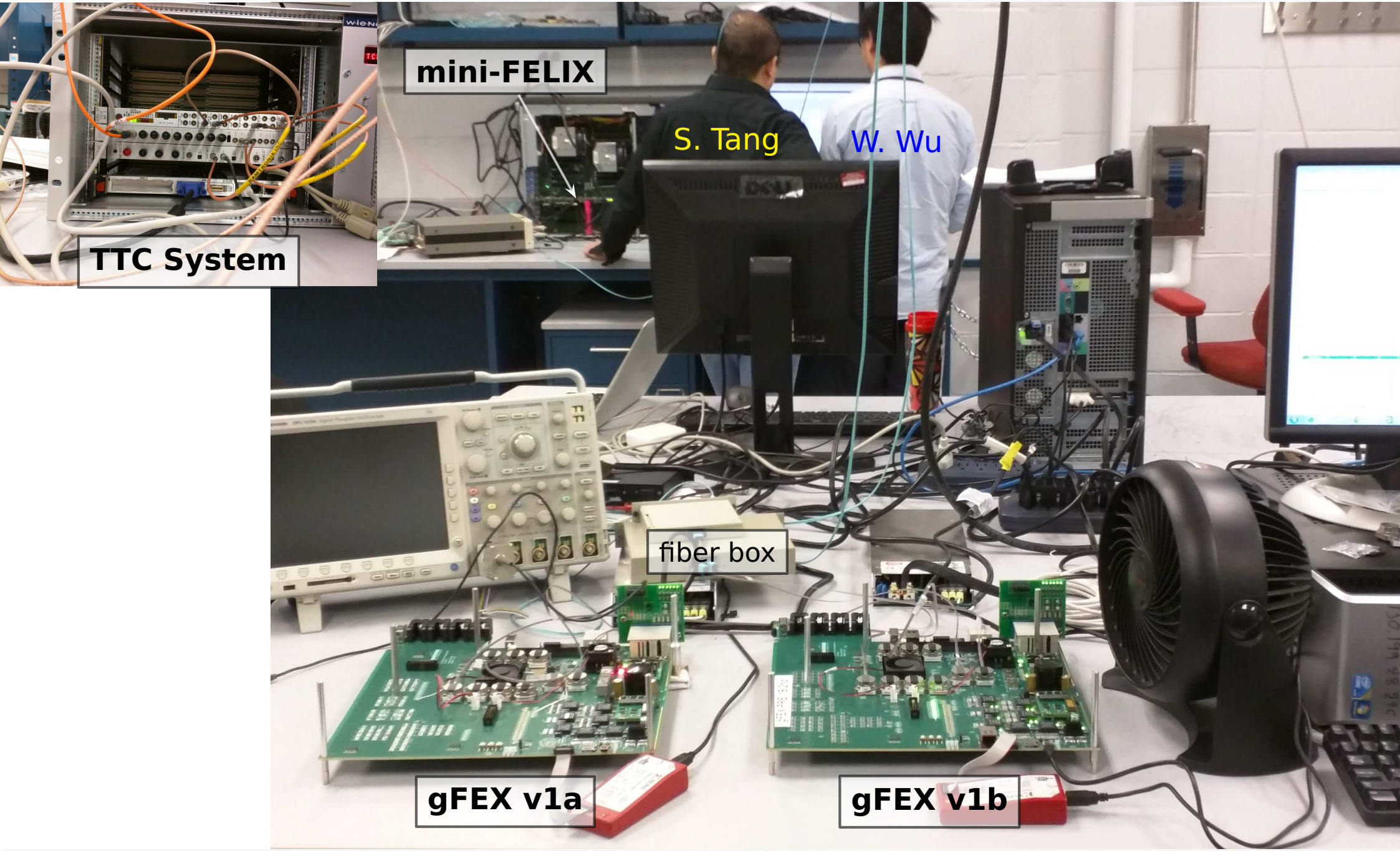
- ***gFEX prototype module integrated with FELIX TTC***
  - connected two gFEX prototypes (v1a & v1b) with recovered TTC clock
    - *gFEX v1a served as source and gFEX v1b as sink*
    - *each miniPOD tested separately*
    - *24 Tx→24 Rx*
    - *1→2 passive optical splitter*
  - **understanding clock quality and link performance in system integration dominated effort over past 4+ weeks**
    - *clock stability crucial for system integration*

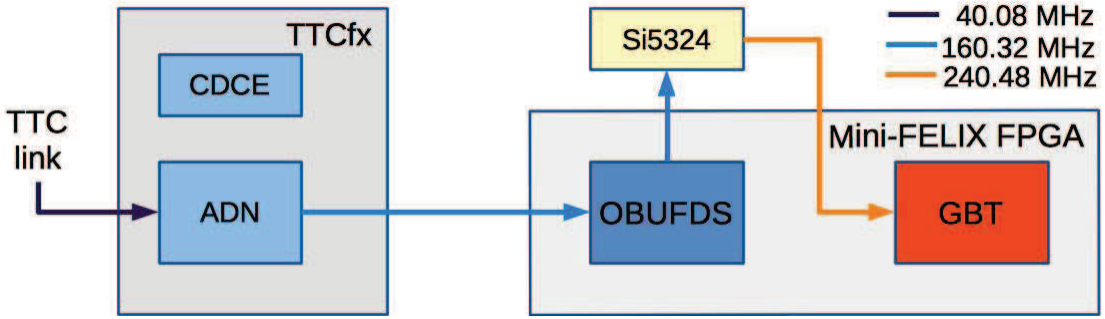


Block diagram of BNL test setup

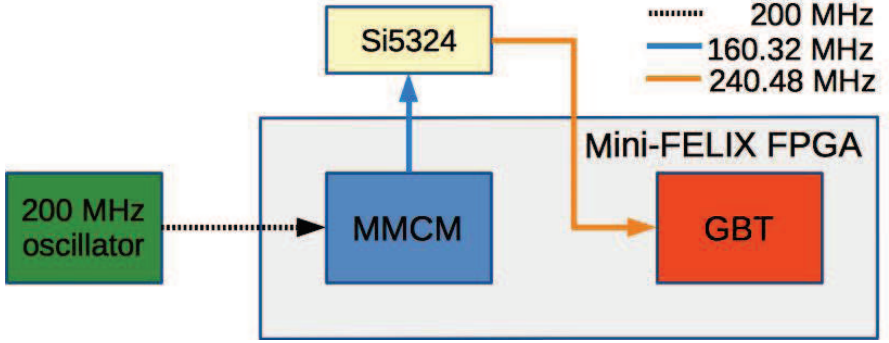
BNL Test Bench



- ***FELIX firmware adjusted to increase stability at high link speeds***
  - TTC clock performance improved on mini-FELIX VC709
    - *necessary for low BER @ 11.2 Gb/s*
    - *propagated into FELIX community [https://indico.cern.ch/event/477465]*
  - **proposed solution:** jitter cleaning through Si5324 clock chip
    - *occasional data bursts (1/day) & slight frequency drift under investigation*



  - **backup solution:** MMCM generates 160.32 MHz clock from 200 MHz oscillator
    - *yields very stable links*



gFEX Firmware Status

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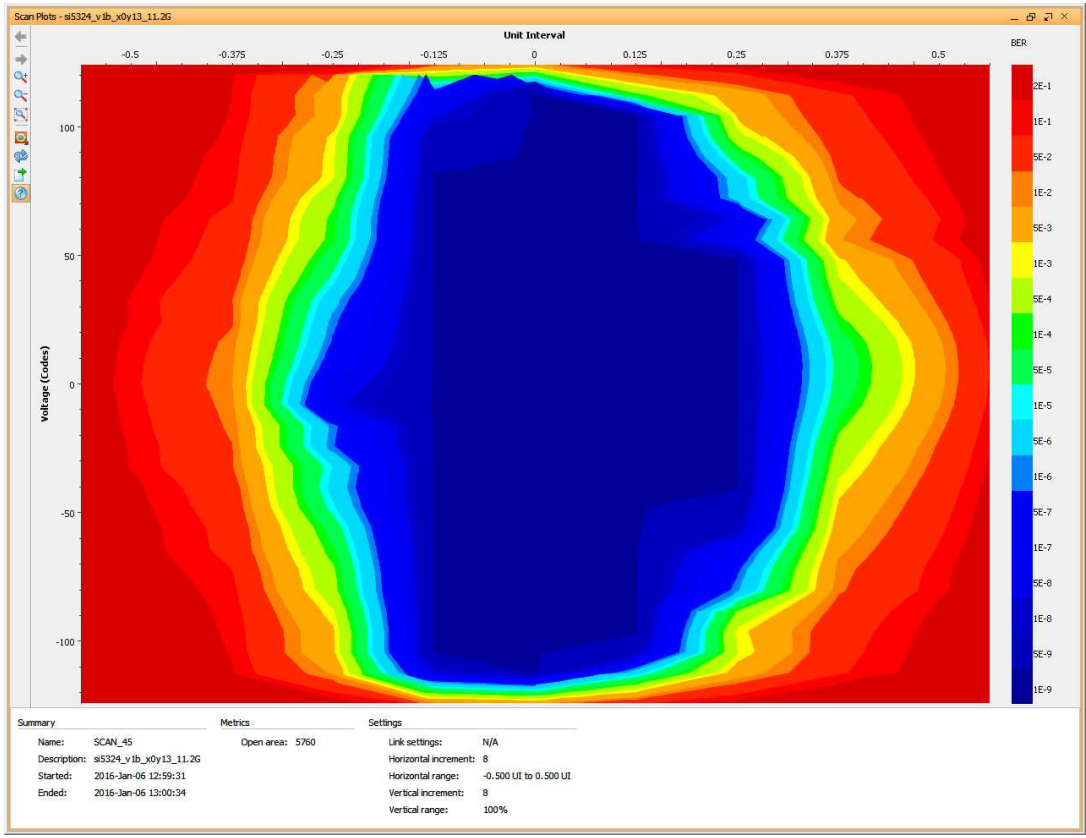
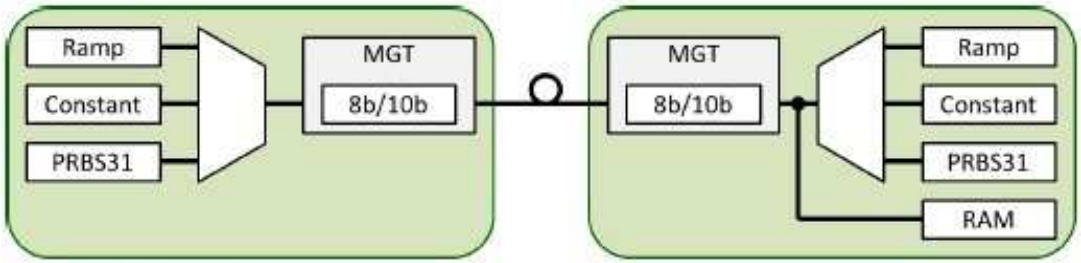
- ***Firmware A (IBERT)***
  - bench tests complete
  - BER< 10^{-15} @11.2 Gb/s with 80 MGT enabled

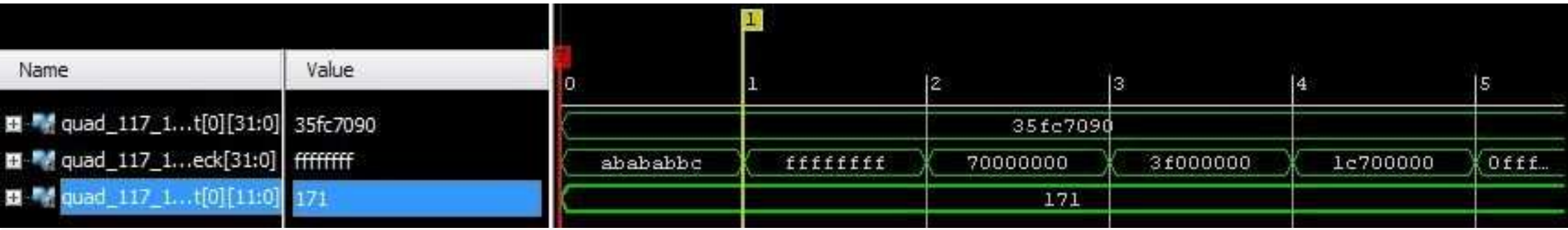


- ***Firmware B***
  - using LAr firmware (send & receive)
  - all modes work: ramp, constant, PRBS31
  - long-term stability tests on going



Test Firmware B

PRBS31: 1.71×10^{12} bits received without error



gFEX Software Status

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Directory listing for /sys/devices/soc0/amba/f8007100.adc/iio:device0/

Filename	Size	Content type	Content encoding
events/		[Directory]	
power/		[Directory]	
subsystem/		[Directory]	
dev	4K	[text/html]	
in_temp0_offset	4K	[text/html]	
in_temp0_raw	4K	[text/html]	
in_temp0_scale	4K	[text/html]	
in_voltage0_vccint_raw	4K	[text/html]	
in_voltage0_vccint_scale	4K	[text/html]	
in_voltage1_vccaux_raw	4K	[text/html]	
in_voltage1_vccaux_scale	4K	[text/html]	
in_voltage2_vccbram_raw	4K	[text/html]	
in_voltage2_vccbram_scale	4K	[text/html]	
in_voltage3_vccpint_raw	4K	[text/html]	
in_voltage3_vccpint_scale	4K	[text/html]	
in_voltage4_vccpaux_raw	4K	[text/html]	
in_voltage4_vccpaux_scale	4K	[text/html]	
in_voltage5_vccoddr_raw	4K	[text/html]	
in_voltage5_vccoddr_scale	4K	[text/html]	
in_voltage6_vrefp_raw	4K	[text/html]	
in_voltage6_vrefp_scale	4K	[text/html]	
in_voltage7_vrefn_raw	4K	[text/html]	
in_voltage7_vrefn_scale	4K	[text/html]	
name	4K	[text/html]	
sampling_frequency	4K	[text/html]	
uevent	4K	[text/html]	

- ***IPBus***
  - gFEX runs SLC6 Linux
    - *components exposed through /sys/devices tree*

      `/sys/devices/soc0/amba/f8007100.adc/iio:device0/`
  - IPBus implemented in python (runs on PS not PL!)

    overview: `https://indico.cern.ch/event/471250/contribution/15/attachments/1208699/1762186/20160107_L1CaloMeeting.pdf`

    code: `https://github.com/kratsg/ironman`

    documentation: `https://iron-man.readthedocs.org/`

gFEX Summary

- ***The gFEX is ready for the Link Speed Test***
  - stable links at 11.2 Gb/s with Firmware A & B
  - updated FELIX firmware for FLX-709
  - IPBus running smoothly

- ***W. Wu will be present for gFEX***
  - H. Chen available first week
- ***Equipment brought from BNL:***
  - gFEX prototype v1b module
  - power supply, cords, and adapter
  - JTAG and cables
  - fiber patch box: MTP-12 to 6 pairs of LC fibers

Backup Slides